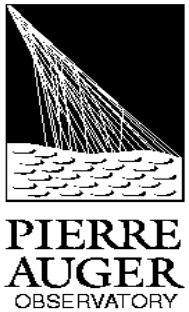

PIERRE AUGER OBSERVATORY

Water Production and Water Quality

I. Allekotte & C.Bonifazi

Malargüe, October 11-15, 2002

Water Production

Water Plant Status:

* May 21-22: Power Supply was repaired
* Water Plant working without stops
* New problem: Water resistivity ~ 12 MOhms-cm. Apparently alkaline problem.
* Mixed Resin used after EDI to obtain high resistivity values (~ 17 Mohms-cm).
* Old problem to solve is the Softener autonomy (14 hs).

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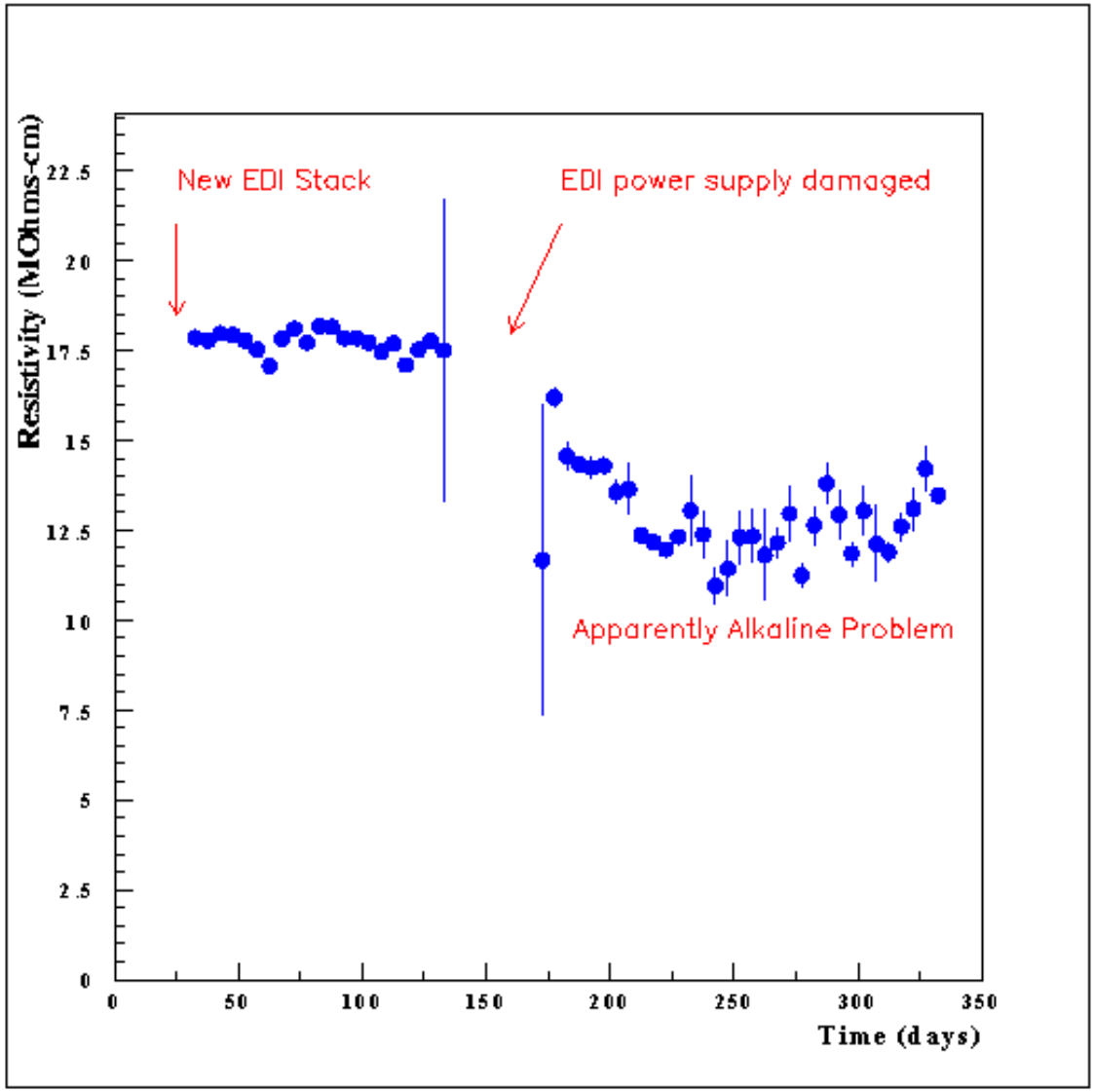
Resistivity - 2002



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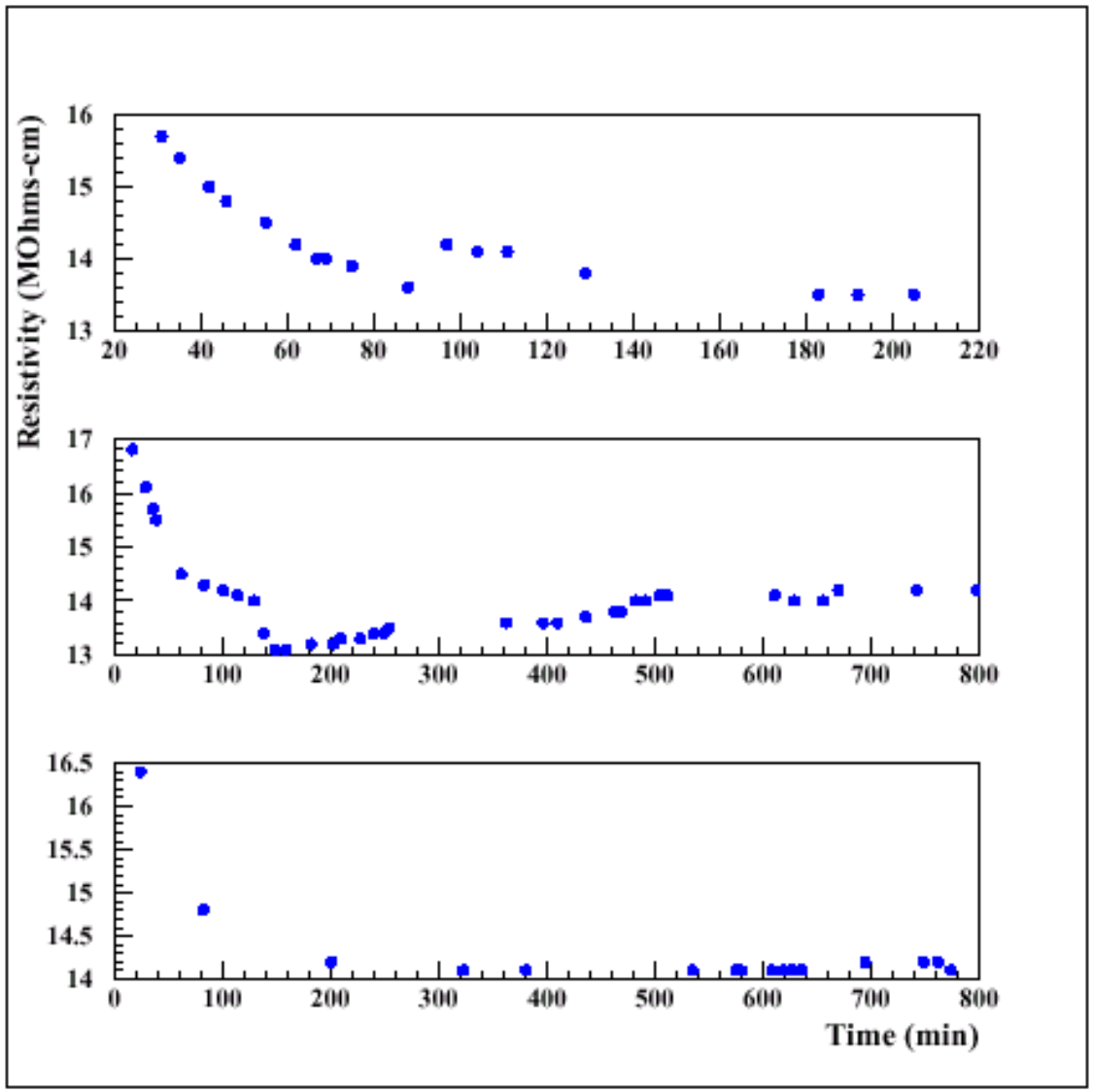
Resistivity Cycles



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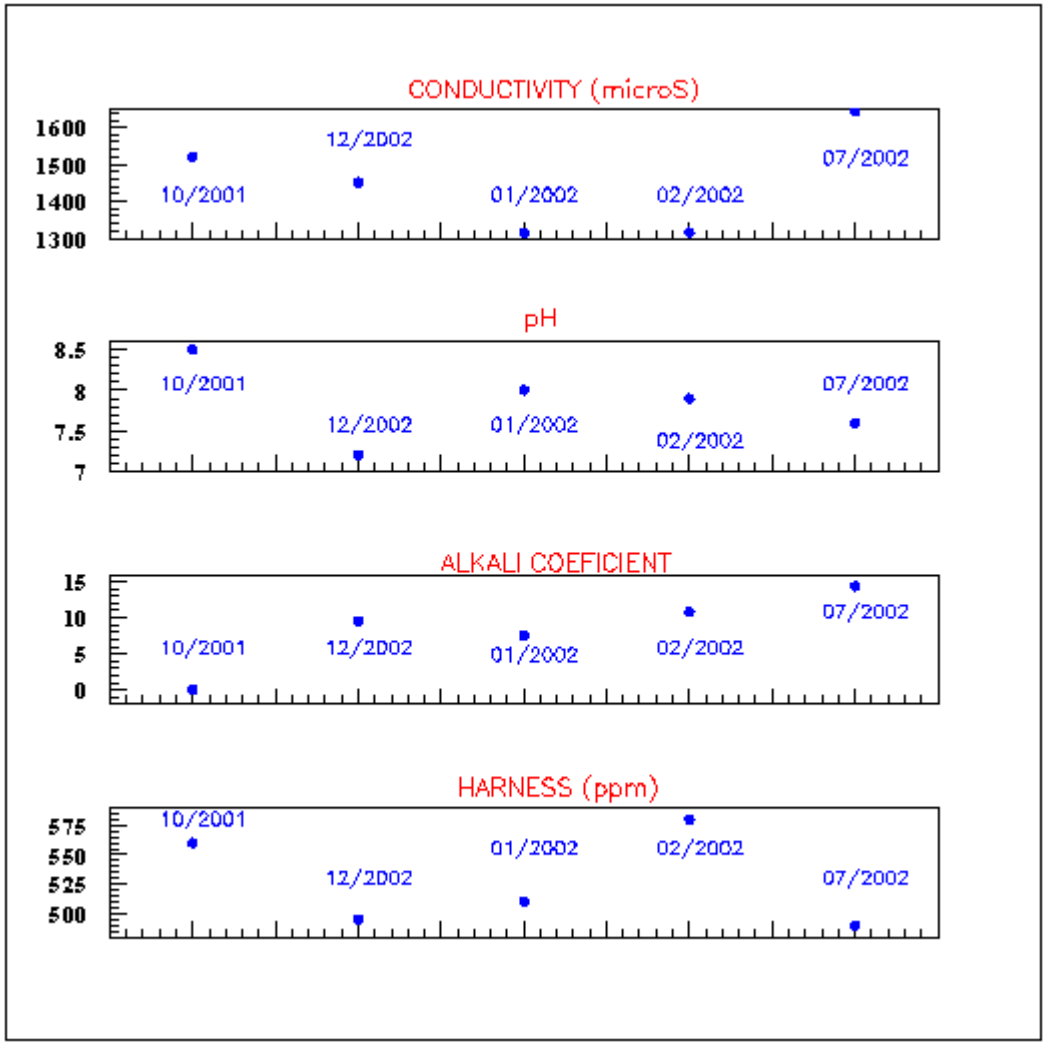
Physical-Chemical Cistern Water Analysis



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Water Quality

Parameters Measured:

- **Water Resistivity:** Measured in every step of water production and water delivery.
- **Biological Activity:** Samples have to be taken in a sterile container and sent to a biochemist in San Rafael to do the corresponding analysis. Samples from tanks and water production steps.
- **TOC (Total Organic Carbon):** This parameter was measured in different water production steps and in one pre-production tank (Piuquen). Water samples have to be taken in a special cup and send to a laboratory in Bs As.
- **Decay Time:** Since May, muons pulse shape are acquired from the EA-tanks. The decay time is related to the quality inside the tank, i.e. water, liner and PMT coupling

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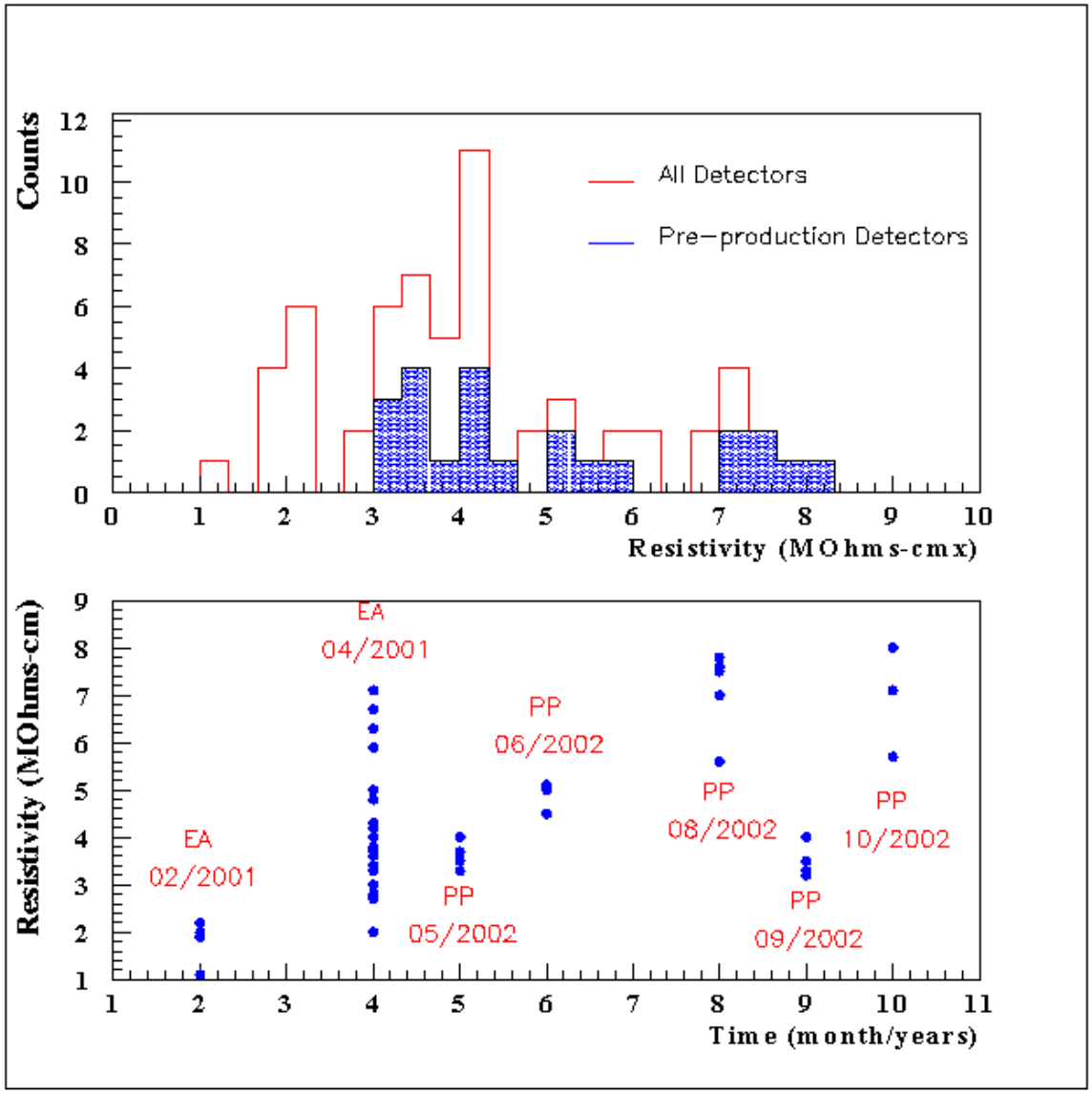
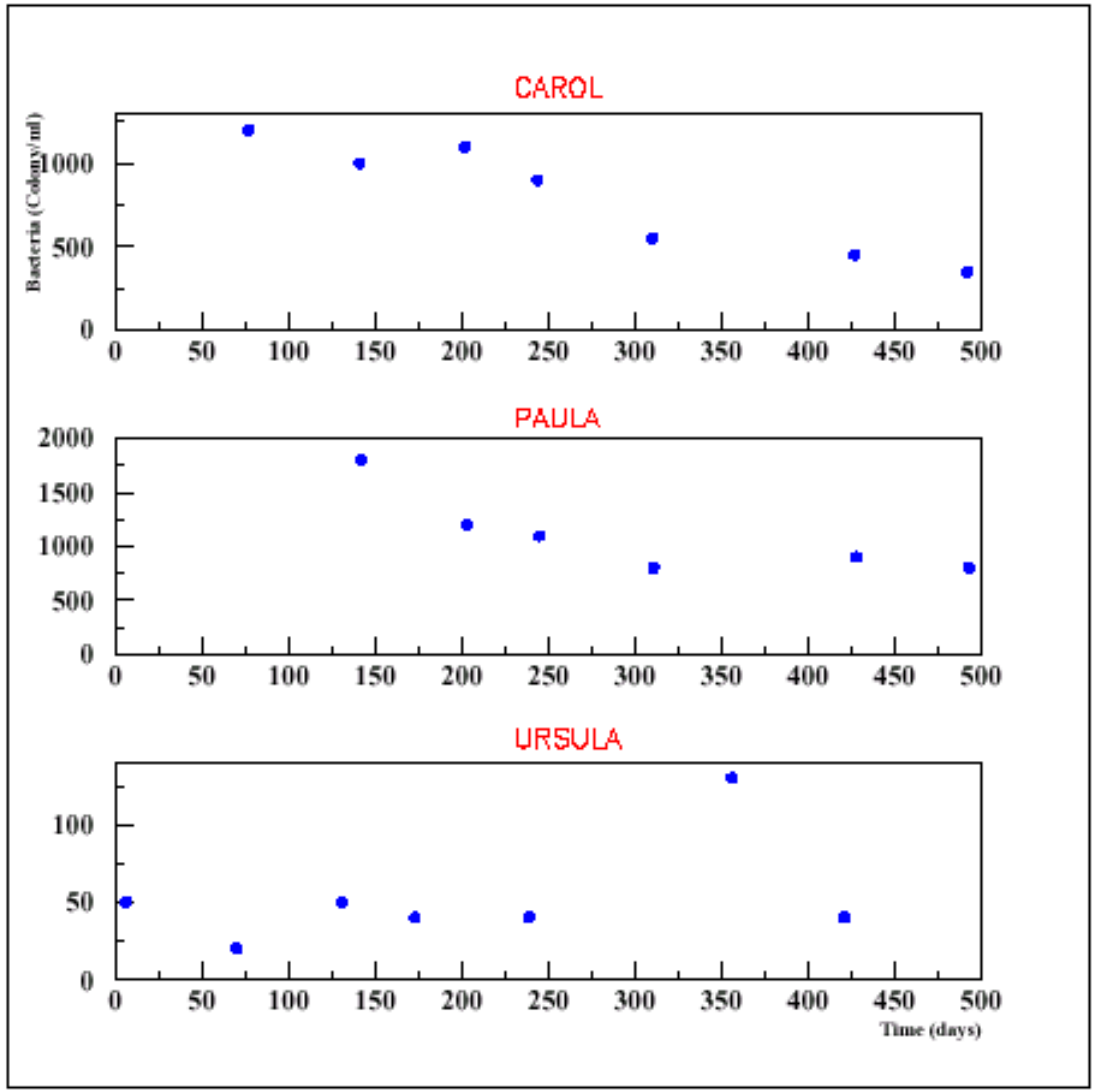
Resistivity Measurements



PIERRE AUGER OBSERVATORY

Biological Analysis - EA Detectors



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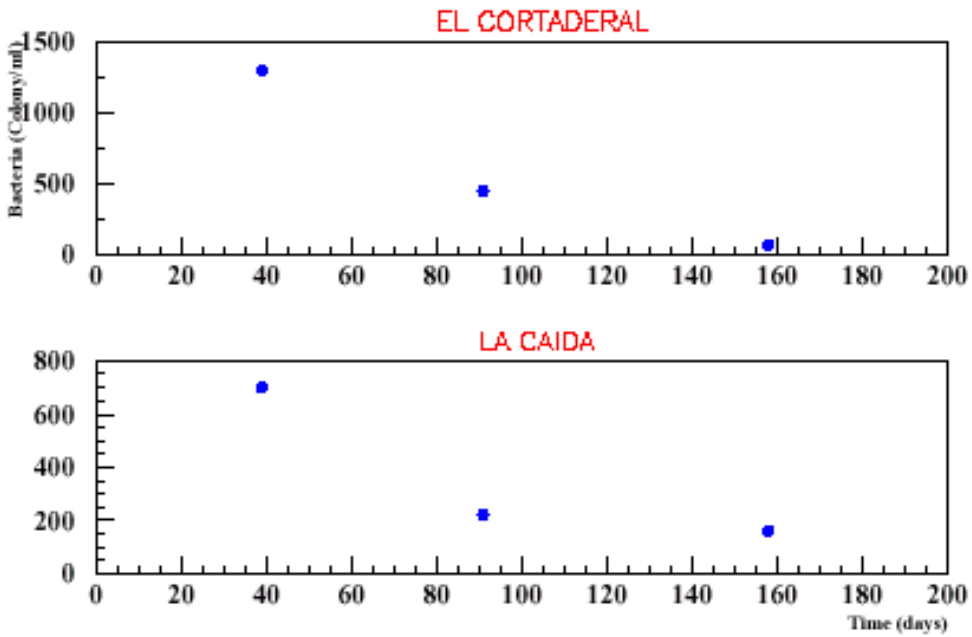
Biological Analysis - PP Detectors



HEIDI	60 Colonies / ml
ROSA	None
PIUQUEN	None
MARINA	None

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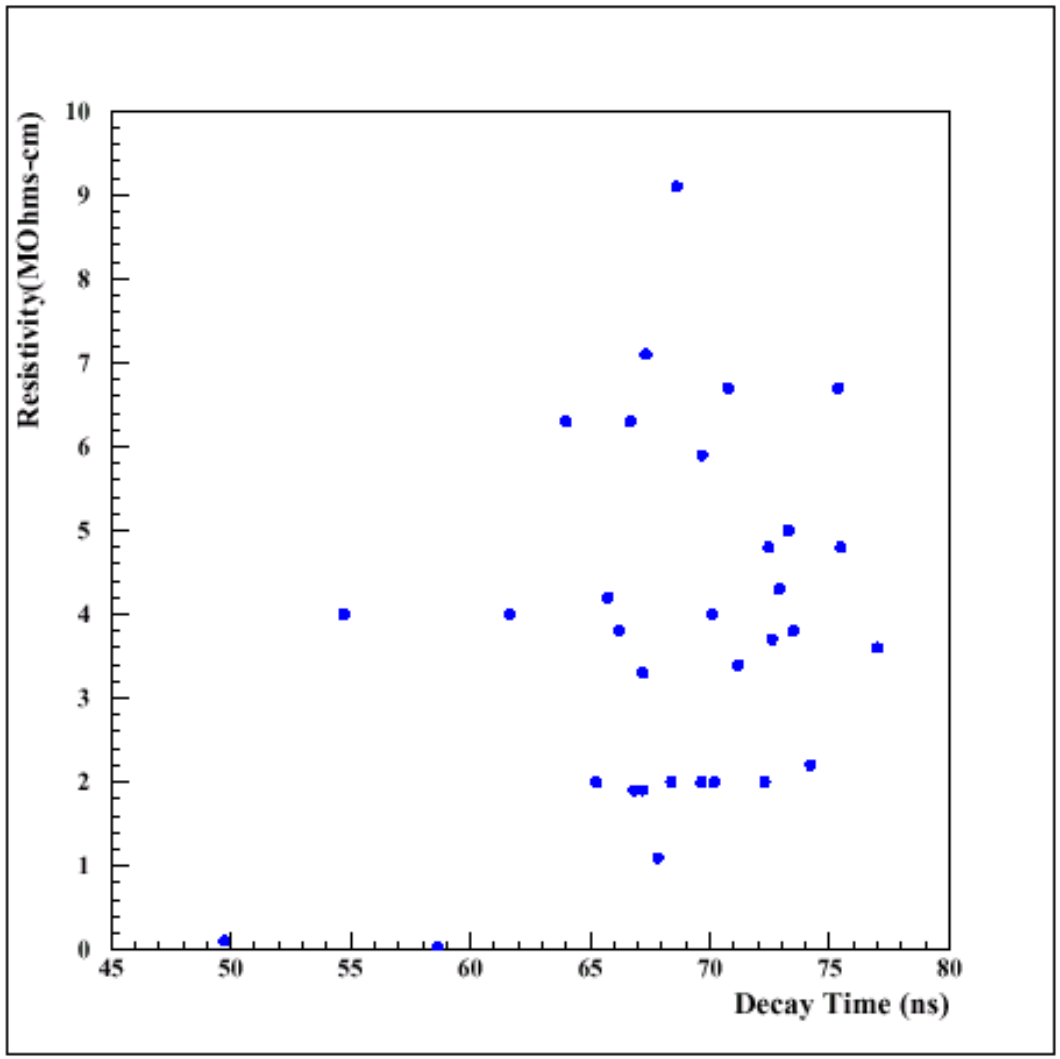
Resistivity and Decay Time



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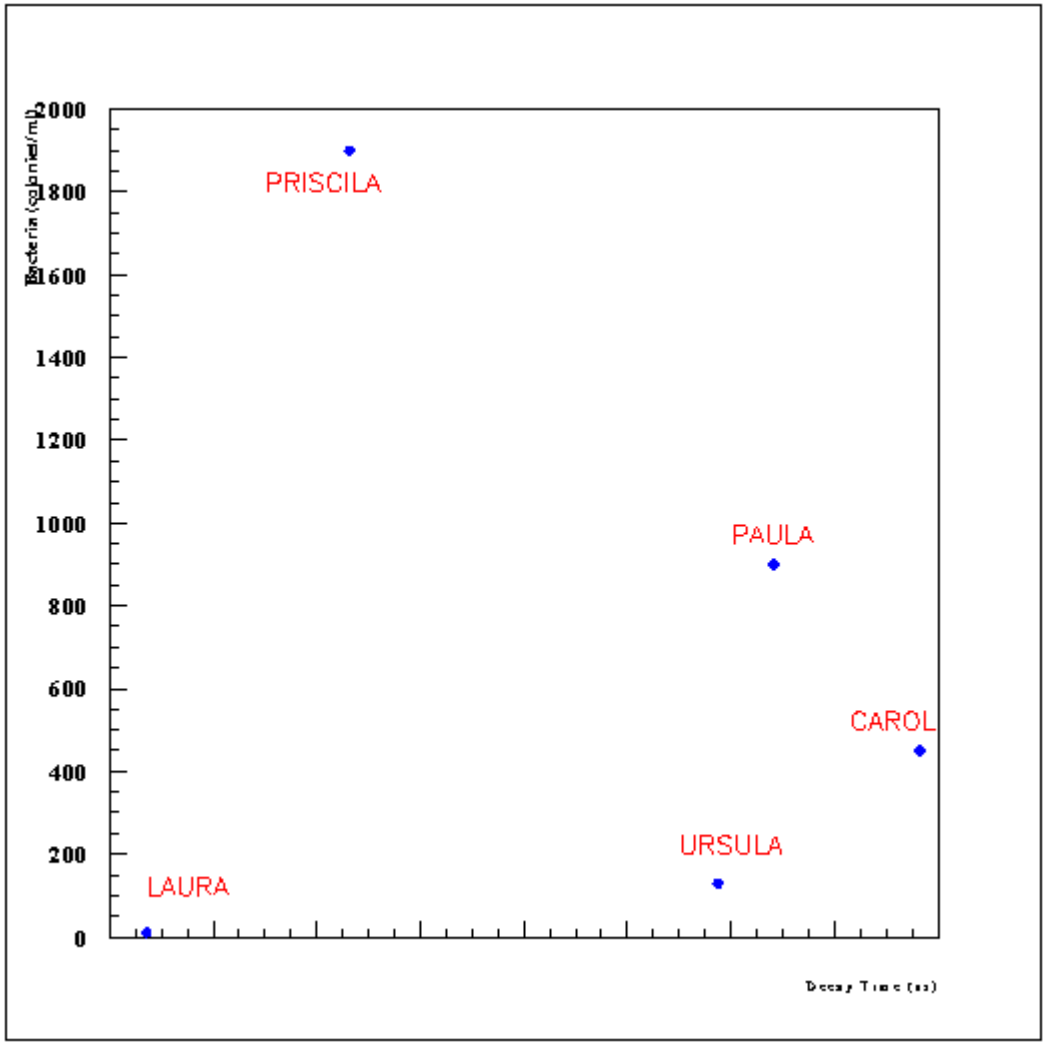
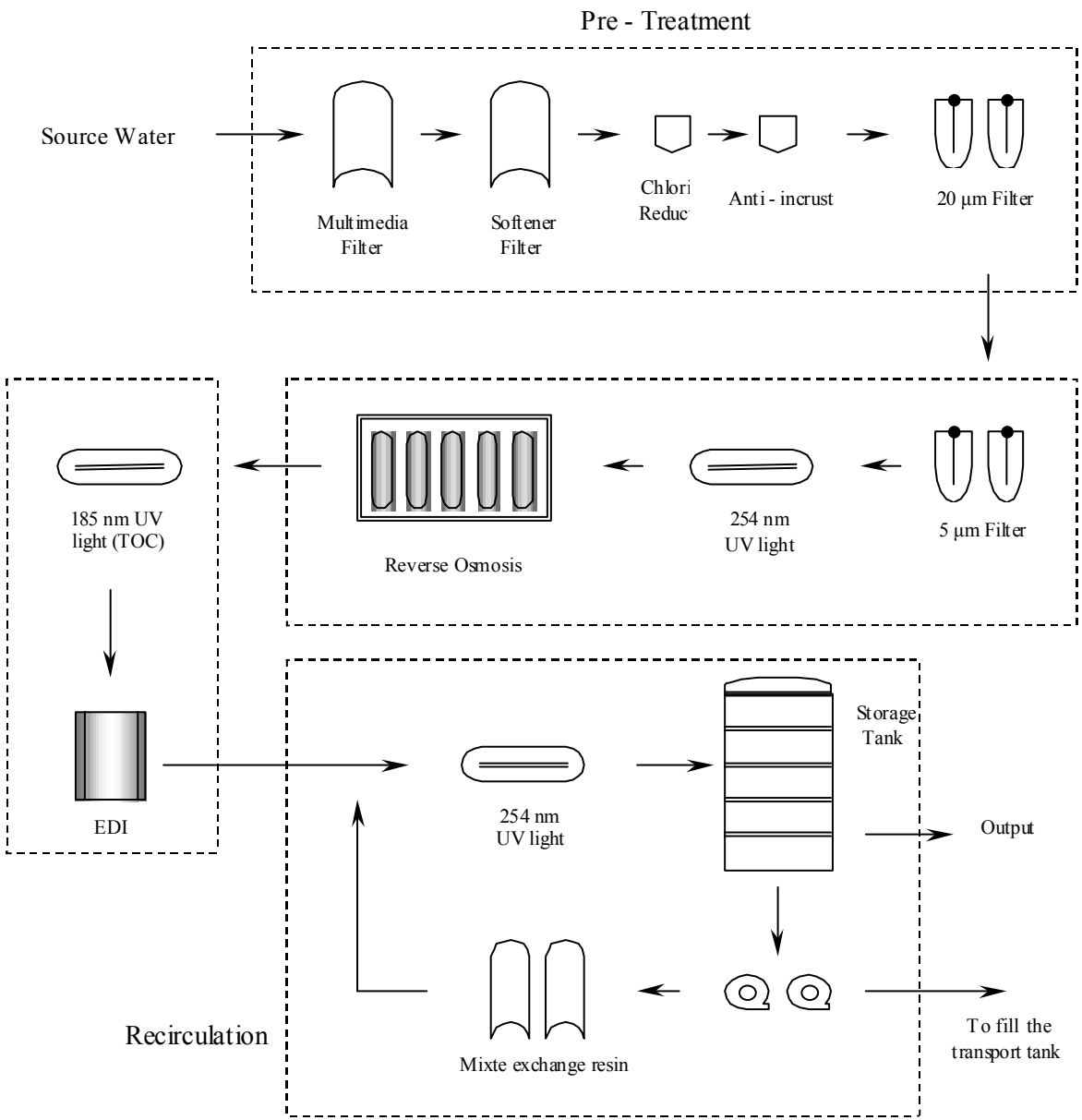
Bacteria and Decay Time



Water Plant Scheme



Biological Analysis
Water Plant

PIERRE AUGER OBSERVATORY

June, 2002

	Number of colony forming bacterias/ml (after 24h)	Number of colony forming bacterias/ml (after 48h)
Cistern	0	0
Pre-Treatment	10	10
Reverse Osmosis	60	90
EDI	0	0
Storage Tank (TK-50)	30	30

July - August, 2002

	Number of colony forming bacterias/ml (after 24h)	Number of colony forming bacterias/ml (after 48h)
Storage Tank (TK- 50)	15	75
Transport Tank (TK-12 Alpha)	10	20
Transport Tank (TK-12 Beta)	10	15

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TOC Measurement

October, 2002

	TOC (ppb)
Cistern	332 ± 35
Between Reverse Osmosis – UV 185 nm	105 ± 15
Between UV 185 nm – EDI	228 ± 23
EDI Outlet	100 ± 16
Storage Tank (Tk – 50)	122 ± 13
Piuquen (Pre-production Tank)*	< 100

* Sample not correlated with Water Plant samples

TOC

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Pharmaceutical Water Qualities(*)

WPU: Purified Water

TOC	< 500 ppb
Conductivity	< 1.3 µS/cm (25°C)
Micro-organisms	< 100 cfu/ml

WFI: Water for Injection

TOC	< 500 ppb
Conductivity	< 1.3 µS/cm (25°C)
Micro-organisms	< 100 cfu/ml
Endotoxins	< 0,25 EU/ml (LAL-Test)

(*) United States Pharmacopea (UPS XXIV)

TOC - Monitoring

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Two Posibilities:

- On-line Monitoring

  TOC meter kit instaled in the storage tank (Tk-50) input

  Cost ~ U$S 30,000 (+ taxes)

  Control TOC after EDI and Tk-50

- Periodic Off-line Monitoring

  Samples analyses in a laboratory from Bs. As. (weekly)

  Cost $ 66 each sample (IVA inclued)

  Control 5 points (Total cost ~ $ 400 per week / ~ $ 20,800 per year)

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Conclusions

Water Plant:

Since power supply was repaired the water plant works continually.

Low resistivity production problem was solved using mixed resin, but alkalinity must be treated.

Softener autonomy must be increased in order to produce water for 3 tanks per day (Under discussion with providers)

Bacteria under control

TOC values lower than UPS XXIV requirement

Weekly TOC control will be implement

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Conclusions (Cont.)

Water Delivery

No important water contamination during water delivery process.

Resistivity average values are higher in pre-production than EA.

Tanks

Bacteria decrease for EA Tanks, control will be made but less often (six months).

Bacteria under control for PP Tanks, control should be done regularly, perhaps less often in the future.

Last tanks do not present bacteria contamination

No correlation between Resistivity and Decay Time was found